VISIONS P.O. BOX 22725 LYNDON, KY. 40222
TELEVISION AND VIDEO ENGINEERING INVENTIONS & INNOVATIONS

ORIGINAL FILE

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January 8, 1988

Federal Communications Commission
1919 M Street NW
Washington, D.C. 20026

87-268

Dear Sirs,

Enclosed is my report on the advanced television system that I have been privately developing for the last 14 months. It was conceived independently from the other systems that your committee is currently examining.

My system, which currently exists only on paper (no prototypes built as yet) adresses directly your problem of development of a high-definition television system that is compatible with the NTSC system currently in use in this country. The system, called an Anamorphic Television Receiver (referred to in my notes herein as SCOPE-TV or WTV) utilizes an extended-length picture screen, a primary asset of other HDTV systems, but without the necessity of utilizing a wider bandwith, the major drawback of this system. Another problem that HDTV fails to recognize are the major problems still to be had of broadcasting Cinemascope movies to these sets and retain compatibility with existing sets; the process of creating a broadcast-use flat print from a scope print remains a matter of artistic prudence, not a decision that may be made mechanically.

My system has some sacrifice in horizontal resolution, yet I am confident that future technology will remedy that situation. In the meantime, my system allows manufacturers to commence with immediate production of widescreen televisions, the units' internal design hopefully accomodating later innovations and allows adaptation to a sattelite-based HDTV system similar to NHK's MUSE system in Japan.

A welcome by-product of the new technology is the opportunity to effectively discourage video piracy in this country by consumers and other amateurs. Details of how this system accomplishes this are contained within the report. The system also has possible applications in the computer, industrial, medical, and military fields.

I am currently engaged in the final designs for the schematics and am securing private investment funds. I expect to have some completed plans for a first prototype in August of this year. If you should have any questions, I am available at 502-895-0679 for consultation.

Sincerely,

Lewis Bryan Kelly

Lewis Bryan Kelly

Reports returned

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Q U A N T I C O N T E L E V I S I O N T E C H N O L O G Y

Your organization may be interested in a series of related television patents provided herewith for your examination. Quanticon Inc. offers rights to technology disclosed in these patents and in a pending patent application covering generation and use of improved Cinematic Dithers. If you have sufficient interest, we shall gladly make available a copy the specification and drawings of the pending case for examination.

TECHNOLOGY PRINCIPLE

The basic idea is to restrict Nyquist samples of the luminance and chrominance constituents of color television to a small number of amplitude levels after special dithers have been added. Varying from sample to sample and from frame to frame, the pattern of dithering is tailored to the human visual system in such manner that substantially all perceptible video information and picture quality is preserved despite very coarse quantization. *(Although the issued patents refer to 3-D nasik dithers as "suitable" or "preferable", the Cinematic Dithers disclosed in the pending application are more versatile and convenient and allow better matching to the psychovisual filter.)*

Consider the luminance constituent first: Image details contrasty enough to span at least one step of the luminance quantizer are sampled at every element of the TV raster and on every frame. Such details are therefore reproduced with full spatial and motion resolution. Less contrasty details are reproduced in pel-to-pel fluctuations between adjacent quantum levels (stippling); they are effectively sampled at sub-Nyquist rates, but important subsamples missing from one frame are interlaced during subsequent frames. (See attached photograph.)

For color TV, the chrominance vector is dither-quantized likewise, preferably with neutral chrominance as one of the vector's quantum levels (U.S.P. #4,652,905). Because transmitted

samples are restricted to very few chrominance values, most colors of an individual frame are rendered pointillistically, and patches change color from frame to frame in such manner that persistence of vision blends them into more uniformly colored fields.

NTSC-COMPATIBLE APPLICATIONS

When luminance and chrominance signals each corresponding to Nyquist samples restricted to a few quantum amplitudes are encoded into the standard NTSC composite signal, the composite remains compatible with both standard NTSC receivers and receivers modified to regenerate the quantum levels of each video component. For privacy, these quantum levels can also be scrambled and descrambled by means of digital encryption methods. NTSC-compatible TV signals can therefore be regenerated and encrypted in broadcast and cable systems, in a manner usually associated only with digital signalling. The following applications come to mind, and additional ones may occur to you:

+ Convenient encryption of satellite-relayed signals.
+ Pay-TV using digital decryption keys that can easily be varied between different customers and/or periodically.
+ Elimination of crosstalk between closely spaced channels.
+ Elimination of color distortion due to differential phase.

APPLICATION TO DIGITAL SYSTEMS

Assume that digital luminance and chrominance signals are multiplexed together to provide PCM color television: Because suitable dithering before digitization reduces the number of bits needed for each sample of a component, many fewer bits per second are required in the multiplexed signal than would be needed for comparable picture quality in the absence of dither. In other words, much less channel capacity or bandwidth is required for dither-quantized PCM color television. Furthermore, unlike more complicated digital systems that afford higher compression

ratios, dither-quantized PCM TV does not store video information. Consequently, the system follows rapid motions and scene changes inherently -- in the manner of ordinary broadcast TV -- and does not require motion-compensation circuitry.

VIDEO RECORDING

The patents cover dither-quantized recording on video tapes and disks. Signal-regenerating playback units allow increased tolerances in mass-produced copies. Also, the specific dither pattern can serve as a manufacturer's mark that cannot be erased without impairing the quality of the recorded material; the dither pattern even tags each copy in a manner that identifies the original dither-quantized master.

EXPERIMENTAL TESTS

Black-and-white still photographs simulating individual dither-quantized TV frames and the averages of various sets of successive frames were generated several years ago with the aid of a digital computer. Three-D nasik dithers having 4 phases and 16 or 8 dither sizes were used, and the photos had 192 lines/frame and 256 pels/line; i.e. only about 1/5 as many picture elements as in the standard NTSC raster were processed. Examples of the results have been published and sample prints are available for inspection.

Dither-quantized live TV was tested briefly, using a 256-lines black-and-white closed-circuit digital system and a 3-D version of the nasik dithering. As expected, no flickers, crawls or edge-busyness appeared; and rapid image motion, scene changes, camera panning, etc., were reproduced without spurious effects. It is believed that the improved Cinematic Dithering of the pending patent would have produced even better results, as would scanning at a larger number of picture elements, closer to the number on the standard NTSC scanning raster.

Q U A N T I C O N I N C .

This binder contains the following patents, all assigned to Quanticon Inc.

Patents of the same group have the same drawings and similar specifications, but different claims. Removable clips facilitate passing over repeated matter.

GROUP I

#4,654,704 "Analog Color Television with Regenerable and Encryptable Signals"

#4,617,597 "Compatible Color Television with Regenerable Signals"

#4,568,966 "Compatible Color Television with Regenerable Signals"

GROUP II

4,652,905 "Instantaneous Neutral Colors in Dither-Quantized Color Television"

GROUP III

4,460,924 "Dither-Quantized Signalling for Color Television"

4,275,411 "Dither-Quantized Signalling for Color Television"

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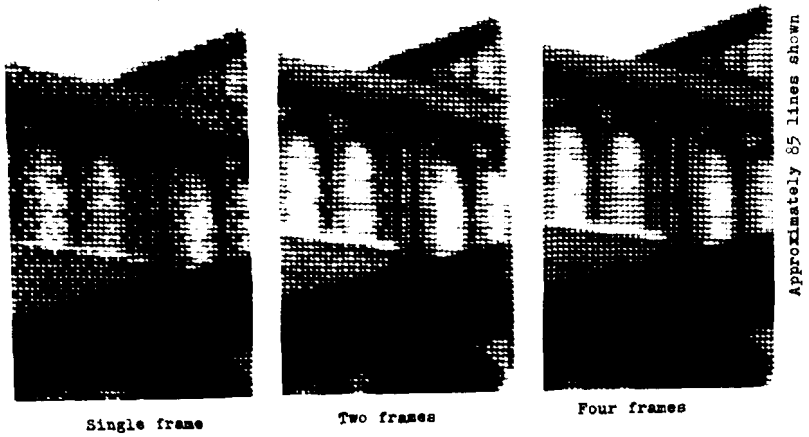
The attached photo shows, on the left, a small portion of one TV frame; in the center, the mean of two successive frames; and, on the right, the mean of four successive frames. Each frame was exposed so that its picture elements correspond to only four shades of gray. Any number of shades larger than one could have been used.

Note that, on a single frame, picture details having at least one-step contrast (25% of the gray scale in this example) are reproduced with full resolution while pel-to-pel fluctuations between adjacent quantum levels (stipple) render the less contrasty information. The low-contrast detail is only subsampled on each frame, but subsamples missing from one frame are inserted during the three subsequent frames so that the mean of four frames is fully sampled.

This picture was dithered with 3-d nasik dither, consisting of a set of four ordered-dither patterns that changed from frame to frame. (For actual black-and-white television, the cycle of four patterns repeated cyclically.) The Cinematic Dithering of a pending patent does not require ordered-dither frame patterns, can be constructed so that the cycle is completed after any whole number of frames, and has other desirable characteristics. 9-2.8

FOUR-LEVEL SAMPLES TRANSMITTED



Approximately 85 lines shown

Single frame Two frames Four frames

ROBERT N. LESNICK
4176 CAMINITO CASSIS
SAN DIEGO, CALIFORNIA 92122
619-455-9413

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87-268

January 22, 1988

Mr. Bert Withers
Engineering Policy Branch
Mass Media Bureau
Federal Communications Commission
Washington, D.C. 20554

Dear Mr. Withers:

I enjoyed talking to you earlier today. As I promised, I am sending you with this note, copies of the Quanticon patents, together with a brief technical description of our improved television system.

I look forward to receiving from you your Notice of Inquiry concerning advanced television systems, together with a list of the names and affiliations of the recipients of the notice.

Thank you for your help.

Very truly yours,

Robert N. Lesnick

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UNITED STATES GOVERNMENT

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MEMORANDUM

RECEIVED

MAR - 4 1988

Federal Communications Commission
Office of the Secretary

DATE: March 4, 1988

REPLY TO
ATTN OF: Chief, Engineering Policy Branch, MMB

SUBJECT: Submissions to be included in the MM Docket No. 87-268 file

TO: Secretary

The material enclosed herein was misdirected to the MMB Engineering Policy Branch. Since it appears relevant to MM Docket No. 87-268, on the implementation of advanced television systems for terrestrial broadcasting, I believe it should be included with the other comments and reply comments in that proceeding.

You will note that the Lessnick and Video Ventions filings were not submitted in a timely manner. However, in view of the fact that we are currently only in a Notice of Inquiry phase of this proceeding, and because this information is timely with respect to external developments relating to advanced television systems, accepting the coments would clearly be in the public interest.

Your assistance in this matter is appreciated.

J. Bertron Withers, Jr.
Chief, Engineering Policy Branch

Enclosures (3):
Hitachi Reply Comments
Quanticon, Inc. video enhancement patent information with cover letter from Robert Lessnick
Video Ventions submission on advanced television with cover letter from Brian Kelly